

# Proactive corporate environmental management: A new industrial revolution

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## Executive Overview

*Corporations in North America, Europe, Japan, and in most newly industrializing nations are embracing environmental protection as part of their international competitive strategies. For many firms, the shift to proactive environmental management is driven by pressures from governments, customers, employees, and competitors. Both consumers and investors are beginning to see more clearly the relationship between business performance and environmental quality. The trend toward proactive environmental management is being accelerated by public pressures on governments almost everywhere to assure a cleaner environment. Government regulations have become more stringent, legal liabilities for environmental damage have become more burdensome, and customers have become more demanding. But more importantly, there is growing evidence that firms that adopt proactive environmental management strategies become more efficient and competitive. In many countries, the public has become more vocal in demanding responsible environmental performance as incomes rise and education spreads. Calls for responsible corporate behavior are coming from investors, insurers, environmental interest groups, financial institutions, and international trading partners.*

## A New Industrial Revolution?

The Swiss industrialist and former chairman of the Business Group for Sustainable Development, Stephen Schmidheiny, predicted in 1990 that changes in environmental thinking would bring "... a new industrial revolution. It is the most forceful trend in my lifetime. It will reshape business because it will redefine the rules of the game."<sup>1</sup> The rapid changes occurring in corporate environmental management during the 1990s may validate predictions by environmentally conscious business leaders about a new industrial revolution in the 21st century. In the United States and most western countries, protection of the environment is no longer the contentious issue it was two decades ago. Environmental sustainability—the need to protect the environment and conserve natural resources—is now a value embraced by the most competitive and successful multinational companies.<sup>2</sup> The McKinsey Corporation's survey of more than 400 senior executives of companies around the world found that 92 percent agreed with Sony Corporation president Akio Morita's assertion

that the environmental challenge will be one of the central issues of the 21st century.<sup>3</sup> Nearly all executives responding to McKinsey's survey acknowledged their corporation's responsibility to control pollution, and about 83 percent agreed that corporations have an environmental responsibility for their products even after they leave the plant. A primary concern of most businesses now is how to manage their environmental impacts effectively and efficiently.

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Progressive companies are shifting rapidly from a strategy of regulatory compliance to one of proactive environmental management. The revolution in thinking has gone through three stages: 1) the

widespread business practice in the 1960s and 1970s of coping with environmental crises as they occurred and of attempting to control the resulting damage; 2) the reactive mode in the 1980s of struggling to comply with rapidly changing government environmental regulations and minimizing the costs of compliance; 3) the proactive environmental management strategy in the 1990s, through which corporations began to anticipate the environmental impacts of their operations, take measures to reduce waste and pollution in advance of regulation, and find positive ways of taking advantage of business opportunities through total quality environmental management.<sup>4</sup> For many firms, environmental values are now becoming an integral part of their corporate cultures and management processes. In a growing number of companies, environmental impacts are being audited and accounted for as a "second bottom line."<sup>5</sup> Although environmental impacts are not always measured in conventional financial terms, they have a special value that companies find increasingly difficult to ignore.<sup>6</sup>

Quality-driven businesses are learning that pollution prevention is often far less costly than regulatory compliance. And cutting-edge firms are going beyond preventing pollution in their own operations and exploring new opportunities for developing green products, processes, and technologies. Expanding markets for pollution-prevention technologies, processes, and services offer companies that develop them new sources of revenues, and technology diffusion will assist governments around the world to control more effectively the emission of air and water pollutants that degrade environmental resources.

### Forces Driving Proactive Environmental Management

Progressive corporations are now looking at environmental performance from a far different perspective than they did a decade ago.<sup>7</sup> Beyond complying with increasingly more stringent regulations, they must protect or enhance their ethical images, avoid serious legal liabilities, satisfy the safety concerns of employees, respond to government regulators and stockholders, and develop new business opportunities in order to remain competitive in world markets. Market and business factors play the most important roles, but a wide array of forces are driving corporations to adopt proactive environmental management strategies. (See Figure 1.)

### Regulatory Demands

Not complying with government regulations is no longer an option for corporations that seek to be competitive in international markets. Environmental liability has grown immensely in the past 30 years as the public has put increasing pressure on governments to enact environmental regulations and legal restrictions that mitigate the adverse effects of pollution. In the United States and many other industrialized countries, however, environmental legislation was adopted piecemeal, creating a complex regulatory process.<sup>8</sup> In 1970 there were about 2,000 federal, state, and local environmental rules and regulations in the United States; today there are more than 100,000. The code of Federal Regulations for protection of the environment currently exceeds the size of the U.S. Tax Code. Environmental regulations are listed in over 789 parts of the Code of Federal Regulations.

A command-and-control system for environmental management became the foundation for scores of environmental, health, and safety programs and thousands of federal, state and local standards, regulations, and guidelines within which businesses must operate. The regulations of such agencies as the Federal Trade Commission and the Securities Exchange Commission can also be used to protect the environment, as can local ordinances, police powers, and common law. Businesses in Los Angeles, for example, must answer to 72 separate authorities, having jurisdiction over environmental protection.

Companies that apply total quality management (TQM) principles effectively have fewer problems with environmental compliance. Constant monitoring and improvement reduce incentives to use patchwork or tack-on pollution-control technology. Error- and waste-reduction objectives lead companies to explore pollution prevention options and to use clean technologies.

### Cost Factors

Noncompliance brings companies legal and ethical crises that are becoming more expensive to overcome. In the United States, the Federal government has steadily increased its enforcement of environmental regulations, making business executives and owners liable for environmental pollution. The U.S. Environmental Protection Agency takes hundreds of enforcement actions against businesses every year, leading to prison sentences and heavy fines.

But many firms are finding that merely complying with regulations can also be an expensive

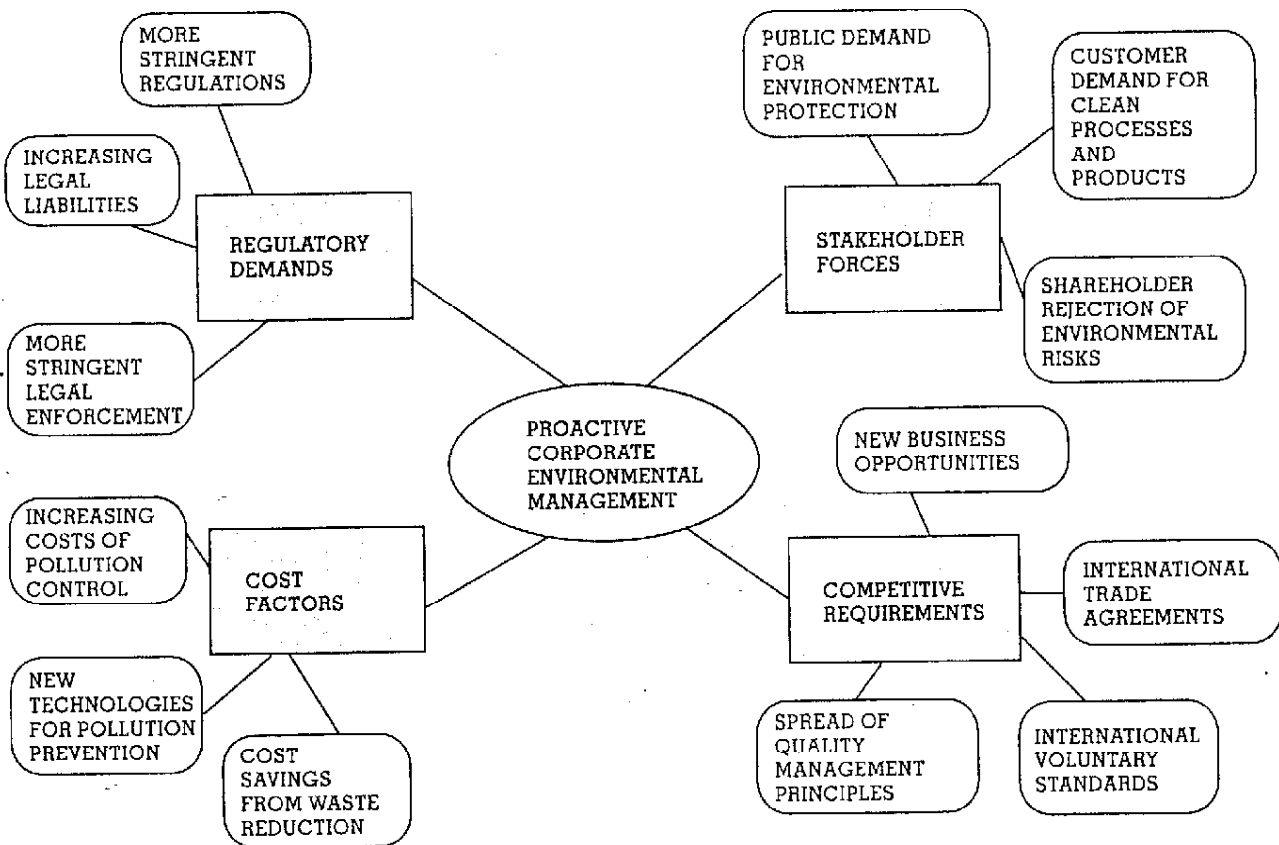


FIGURE 1

## Forces Driving Proactive Environmental Management

strategy. The total costs of complying with environmental laws over the past 25 years have easily exceeded \$1 trillion. About \$120 billion is spent annually for pollution abatement and control. Current estimates of compliance costs under the new Clean Air Act Amendments alone are on the order of \$50 billion a year. Many companies will spend hundreds of millions of dollars on environmental projects over the next few years simply to stay abreast of environmental regulations.

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Clearly, sound and well-enforced regulations have brought tremendous progress in reducing air and water pollution and toxic hazards in the United States and other countries. But the piecemeal, complex, and ever-changing regulatory system has made enforcement of controls increasingly more expensive and marginally less effective for both

business and governments. Furthermore, reliance on constantly changing regulatory controls may simply produce a temporary false sense of security. Since controls require add-on technologies that companies must replace or modify every time regulations change or new ones are added, businesses are constantly struggling to comply, the growing complexity of regulation and the all-too-common technical inefficiencies and administrative weaknesses of command and control are spawning corporate interest in prevention of environmental damage rather than mere compliance with regulations.

#### Stakeholder Forces

Proactive strategies that build on basic management principles of reducing waste and cutting costs also respond to customer and shareholder demands. Firms seeking to satisfy diverse stakeholders have discovered that proactive environmental management requires more than simple adjustments to government policies. The strategies may require firms to make more effective use of corporate intelligence to define new missions, re-

align company value systems, find new ways of managing change, accelerate training and education, and modify behavior throughout the organization. For many firms, the challenge is to balance concerns with cash flow, profitability, and environmental protection in order to respond to the demands of increasingly diverse groups of stakeholders. Many companies that adopted quality management programs to improve their competitive positions—3M, Kodak, Sony, Alcoa, Volvo, Procter & Gamble—are also recognized by their stakeholders for exemplary environmental performance. This should not be surprising. Companies that practice some form of total quality management constantly monitor and improve their operating processes. They are customer-focused, use performance measurement, employee training, and error- and waste-reduction, and involve their suppliers in environmental improvements.

### Competitive Requirements

The expansion of the global market and the proliferation of international trade agreements are also driving the movement toward voluntary international standards for environmental quality management.<sup>9</sup> International competition motivated more than 127,000 companies in 99 countries to become certified by 1996 under the ISO 9000 series guidelines for quality management.<sup>10</sup> TQM has had a profound effect on how businesses view their management systems and has indirectly stimulated improvements in environmental performance.<sup>11</sup> The growing recognition by many business leaders of the importance of environmental protection to their international competitive advantage has led to new rounds of proactive voluntary standards emphasizing the integration of environmental management and corporate strategy. The American Society for Testing and Materials (ASTM) is making headway in standardizing environmental auditing, assessment and criteria for investment and insurance. British standard BS7750 was an industrial response to the adoption of the 1990 Environmental Policy Act in Great Britain that has been widely adopted internationally. The European Community has issued a Standard Eco-Management and Audit Scheme (EMAS), which member nations are expected to implement. And the ISO 14000 series is likely to become the dominant international standard for environmental management systems.<sup>12</sup> Although these standards differ somewhat in their requirements and criteria, they seek explicitly to encourage corporations to integrate environmental- and corporate-management systems.

### Approaches to Proactive Environmental Management

Multinational corporations (MNCs) have gone through a dramatic transformation in their approaches to environmental protection, from 1) avoiding compliance with regulatory controls during the 1960s and 1970s to 2) reacting to regulatory requirements and attempting to minimize the costs of compliance during the 1980s to 3) taking control of their environmental problems and even turning them into competitive opportunities during the 1990s.<sup>13</sup> (See Figure 2.)

A few large corporations like 3M and SC Johnson began to adopt a proactive approach to environmental management in the mid-1970s, but they were clearly the exceptions. During the 1960s and 1970s, most companies tried to avoid or evade government regulations. A few enlightened corporations, such as 3M, designed programs to help the company solve its own environmental problems, prevent pollution at the source, develop products that have a minimum effect on the environment, conserve natural resources, meet and sustain government regulations, and assist selectively government agencies' environmental activities. Since 1975, the 3M Pollution Prevention Pays Program has supported more than 4,400 employee-generated projects worldwide, curtailed 1.4 billion pounds of pollutants, and saved \$750 million.<sup>14</sup>

During the 1980s, the growing demands of the public and governments for pollution control and environmental cleanup required corporations in North America and western Europe to comply with regulations, although many viewed compliance as a cost to be minimized. During the mid- to late-1980s executives in many larger corporations began to realize that waste reduction saved money. The forces described earlier began to push many firms into strategies that went beyond compliance.

In the late 1980s proactive environmental management and the total-quality-management movement began to converge. TQM initiatives gave firms unexpected insights into how to make environmental management cost-effective and market-driven. By the beginning of the 1990s, waste minimization programs had been adopted by a diverse group of U.S.-based MNCs, among them Allied Signal, General Dynamics, Dow Chemical, Chevron, Boeing, AT&T, Amoco, General Electric, IBM, Polaroid, and Xerox.<sup>15</sup> Many successful businesses were voluntarily performing internal environmental compliance audits to identify and correct their environmental liabilities, demonstrate good-faith effort, and reduce government pressures. More importantly, the voluntary audits forced businesses

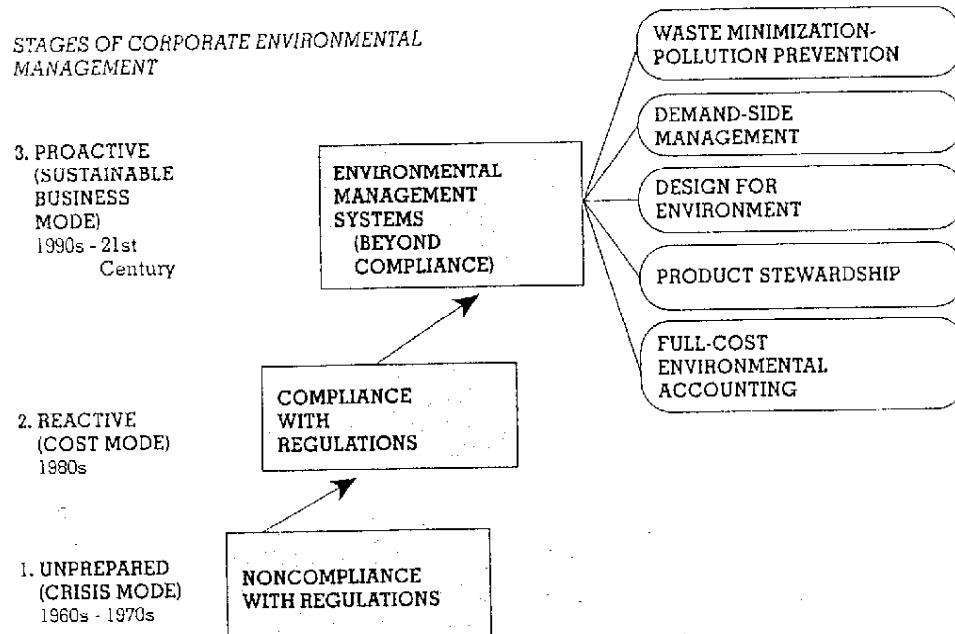


FIGURE 2

## Stages of Corporate Environmental Management

to evaluate operating systems, identify the actual cost of controls, and develop environmental performance strategies to eliminate liabilities altogether.

### Proactive Environmental Management

Cutting-edge corporations in the United States and around the world are now using comprehensive environmental management systems that include combinations of five major approaches: 1) waste minimization and prevention; 2) demand-side management; 3) design for environment; 4) product stewardship; and 5) full-cost accounting.

#### Waste Minimization and Prevention

Truly effective environmental protection requires the prevention of pollution rather than the control of wastes at the end of the pipeline. Pollution prevention is the use of materials, processes, or practices that reduce, minimize, or eliminate the creation of pollutants or wastes at the source. Pollution-prevention technologies in manufacturing include materials substitution, process modification, materials reuse within existing processes, materials recycling to a secondary process, and materials reuse within a different process.<sup>16</sup> Increasing legal liabilities and the rising costs of pollution control and waste disposal have become driving forces for corporations to find more effective ways of preventing pollution. In the 1980s, a growing number of businesses began focusing on, anticipating, and preventing waste

problems before they occurred.<sup>17</sup> Scott Paper, for example, adopted an integrated approach to source reduction, recycling, and reuse, and to materials substitution. Between 1984 and 1988 General Dynamics eliminated almost 40 million pounds of hazardous-waste discharge from its production processes. Chevron reduced hazardous wastes by 60 percent between 1987 and 1990, saving more than \$10 million in disposal costs. General Electric adopted a program to decrease toxic emissions by 90 percent between 1988 and 1993. Xerox reduced hazardous-waste generation by 50 percent between 1990 and 1995.

The search for new approaches to reduce or eliminate waste is now spawning widespread innovation. For example, Earthshell Container Corporation is working with the McDonald's fast-food chain to test an alternative food container using low-cost materials (potato starch, water, calcium carbonate, and cellulose fiber) that are both stronger than conventional paper and polystyrene packaging and that are, after use, fully dissolvable in water. Widespread adoption of this biodegradable packaging will reduce or eliminate problems of disposing of thousands of tons of paper and polystyrene packaging. The new materials are also less energy-intensive to manufacture and do not use CFCs in production, thereby reducing stratospheric ozone depletion, global warming, and other environmental effects.<sup>18</sup>

In Canada, pulp-and-paper companies have joined with government and industry suppliers through the Public and Paper Research Institute of Canada (Paprican) to develop closed-loop mill

technologies that will move the industry toward zero-discharge emissions. The project will not only prevent pollution in the Canadian pulp-and-paper industry but also generate new technologies for export and improve the competitiveness of exported products.<sup>19</sup> Pollution prevention is a powerful business strategy because it encourages the efficient use of raw materials and reduces the costs of waste. But most companies adopt pollution prevention because it provides competitive advantages and satisfies customers' needs. In the process, companies often learn how to control pollution better than the regulators, and at lower cost.

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#### *Demand-Slide Management*

Demand-side management is an approach to pollution prevention that originated in the utility industry. It focuses on understanding customers' needs and preferences and on their use of products, and is based on three fundamental principles: 1) do not waste product (electricity); 2) sell exactly what the customer demands; and 3) make the customer more efficient in the use of the product. Demand-side management forces an industry to look at itself in a new light, which often leads to the discovery of new business opportunities.<sup>20</sup> Demand-side thinking emphasized that utility companies are not primarily in the business of selling electricity or gas, or even light or heat; they are really in the business of selling environmental conditions such as comfort, brightness, and conveyance. By looking at the market in terms of real demand, utilities can prosper by providing customers a variety of environmentally beneficial services, and not just electricity or gas.

Using the demand-side approach, other businesses are exploring profitable ways to move less polluting materials through the economy and the biosphere. Telecommunications firms are developing new and more powerful technologies offering communications services, such as teleconferencing, that reduce the need for physical travel and the pollution resulting from vehicular and air transportation. Electronics firms are miniaturizing products that take less energy and materials to produce and leave less waste for disposal. Demand-side management led Procter & Gamble to develop highly concentrated liquid detergents and refill packs for its

products that saved more than 152,000 tons of packaging material in 1995 alone. P&G also introduced concentrated powdered detergents and hard-surface cleaners, which reduced packaging materials, raw materials, and transportation requirements.<sup>21</sup>

Other companies are substituting less- or non-polluting products for more polluting ones. The process DuPont developed for its Petretec polyester film, for example, breaks down waste in a way that retains its original polyester properties, making it substitutable for virgin materials without depleting natural oil resources. Rather than selling farmers the pesticides needed to prevent crop damage,<sup>22</sup> Monsanto has developed genetically bioengineered plants, such as potatoes and cotton, that are protected against disease and insects. Building protection into plants genetically obviates the need for millions of pounds of raw materials and enormous amounts of fossil fuels for energy to produce pesticides, hundreds of thousands of containers and packages that require disposal, thousands of gallons of fuel to distribute and apply the product, and millions of pounds of pesticide residue that pollute land and water.

#### *Design for Environment*

Design for environment (DFE) is also becoming an integral part of pollution prevention in proactive environmental management. Businesses are finding it far more efficient to design products for disassembly, modular upgradeability, and recyclability at the outset than to deal with disposal problems at the end of a product's life. DFE reduces reprocessing costs and returns products to market more quickly and economically. Procter & Gamble's objective by the beginning of 1998, for example, is to "design manufacturing waste out" of business areas that account for at least 50 percent of its production volume. The company redesigned its powdered laundry detergent packages in Europe and North America to use 80 percent less material than paper cartons and to use 25 percent recycled plastic. The redesign of its soap bar cartons reduced scrap by 14 percent.<sup>23</sup>

Using DFE, Dell Computer Corporation is converting its Optiplex personal computer line to a chassis made completely of recyclable coatings and fillings-free durable plastic and separable preplated cold-rolled steel.<sup>24</sup> Dell is also simplifying upgrades to extend the product's life. Pitney Bowes and the Laidlaw Corporation created a joint venture in 1992 to disassemble and separate office equipment for reuse and recycling. In four years they were able to process more than 30,000 pieces of mailing-system, copier, and facsimile machines,

saving more than 870,000 pounds of materials from landfills.<sup>25</sup> General Motors has designed its Saturn line so that cars are easily disassembled, allowing nearly 95 percent of the automobile to be recycled with less contamination of waste streams. Saturn has also built the industry's first automotive disassembly plant in Maryland.<sup>26</sup>

General Electric Plastics is testing ways of replacing metal components in automotive instrument panels with thermoplastic materials. The substitution allows suppliers to consolidate parts into fewer components for easier manufacturing. The thermoplastic panels will be more cost-effective and less environmentally damaging, since they will be easier to disassemble, recycle, and reuse. Similar product redesigns have been done by Korea's Samsung Electronics for refrigerators, washing machines, and televisions.<sup>27</sup>

### Product Stewardship

Product stewardship—practices that reduce environmental risks or problems resulting from the design, manufacturing, distribution, use, or disposal of products—is yet another concept taking hold in industrial countries seeking to curtail wastes. European countries, following Germany's example, are establishing takeback laws that make companies responsible for reclaiming, recycling, or remanufacturing their products. Companies are responding by using product life-cycle analysis (LCA) to determine ways of reducing or eliminating waste at all stages—from raw materials acquisition, production, distribution, and customer use to waste reclamation, recycling, reuse, and disposal.<sup>28</sup> Firms serious about product stewardship seek alternative products and applications that are less polluting, and alternative materials, energy sources, or processing methods that eliminate waste. They also compare the cost of managing for conformance versus for assurance, and adapt to customers' needs, preferences, and uses of products.<sup>29</sup>

Japanese universities and research institutes are applying LCA to a wide range of products from aluminum cans, automobiles, and office buildings to vending machines, washing machines, and steel alloys.<sup>30</sup> Japan's Canon Corporation used life-cycle analysis to extend the life of its toner cartridges and make disposal less environmentally damaging. Procter & Gamble's Italian plant devised a method of printing directly on the plastic container of its dish-washing liquid product, eliminating the need for a shrink-sleeve label and saving 10 tons of thin-film plastic a year. Kodak Pathé started collecting and recycling lead screens from its industrial film cus-

tomers. In 1995, Kodak collected 4.1 tons of lead, representing a 50 percent return on sales.<sup>31</sup>

By assessing its product and processing technologies, SC Johnson was able to cut manufacturing waste nearly in half, reduce the use of virgin packaging materials by more than 25 percent, and reduce volatile organic compound (VOC) use by 16 percent between 1990 and 1995.<sup>32</sup> Its product stewardship projects produced benefits in its plants around the world. The elimination of shrink wrap on auto aerosol products in Japan saved 4.2 tons of plastic; development of lightweight shippers for liquid shoe polish in Mexico reduced corrugate by 125 tons; and conversion to 70 percent recycled plastic in its 5-liter pails in Brazil saved 110 tons of virgin plastic. Significant materials savings resulted from increasing recycled content of bulk delivery drums in Nigeria and adopting lightweight aerosol cans in Turkey.

Sonoco, a worldwide packaging products company, began a successful takeback policy for many of its paper, plastic, and wood packaging products in the early 1990s that reduced waste disposal problems for its customers. But its takeback policy also assured a stable and growing supply of reclaimed plastic and paper materials for the company when the price of virgin materials increases.<sup>33</sup> Sonoco's environmental stewardship not only allowed it to recycle materials in its packaging products but to become an exporter of recycled materials and an increasingly important player in the materials-reclamation business. In 1995 alone, Sonoco's Baker Division recycled nearly 62,000 wood reels that would have required felling more than 21,000 trees to replace. Its High Density Film Products Division reclaimed more than 5,200 tons of plastic grocery bags and 39,000 tons of regrind, an in-plant plastic material that was reused in manufacturing new products. Sonoco's takeback policy allowed divisions and plants to continue environmentally related experiments and to expand business opportunities. Sonoco expanded its paper reclamation networks through purchases of new paper stock operations by its wholly owned subsidiary, Paper Stock Dealers.

### Full-Cost (Environmental) Accounting

Until recently, the concept of environmental cost has had two major dimensions. Environmental costs could refer to costs that directly affect a company's bottom line or to the costs to individuals, society, and the environment for which the firm is not accountable. However, the emergence of full-cost accounting (FCA)—a concept pioneered at Dow Chemical and a few other companies—is beginning to reshape the

concept of environmental accounting and making it essential to business success. Corporations like Dow, DuPont, and Ciba Geigy are using FCA to identify, quantify, and allocate the direct and indirect environmental costs of ongoing operations.<sup>34</sup> FCA identifies and quantifies environmental performance costs for a product, process, or project. FCA considers four levels of costs: 1) direct costs, such as labor, capital, and raw materials; 2) hidden costs, such as monitoring and reporting; 3) contingent liability costs, such as for fines and remedial action; and 4) less tangible costs, such as public relations and good will.<sup>35</sup>

Firms find sound business reasons to account for the full costs of environmental performance. First, many environmental costs can be eliminated by simply changing operational and housekeeping practices. Second, environmental costs in the form of wasted raw material add no value to a process or product, and under most circumstances constitute potential cost savings. Third, understanding the environmental costs and performance of processes and products leads to more accurate pricing and value of goods and services. Corporations can use FCA not only to determine the financial impact of their environmental activities, but also to find less costly alternatives by changing process or product design, increasing prices, or developing an exit strategy to eliminate environmentally costly products.<sup>36</sup> Under traditional accounting systems, these potential savings and business opportunities may be obscured in overhead accounts and otherwise overlooked.

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Many companies, including 3M, DuPont, Allied Signal, Amoco, and Monsanto, have discovered that environmental costs can be replaced by revenues through the sale of waste by-products, clean technologies, or unused pollution allowances. These proactive companies have found that the management of environmental costs does more than improve operational and financial performance; it can also lead to improvements in the health of employees and local communities, enhancing the image of the company as a desirable employer and corporate citizen.<sup>37</sup>

**Proactive Environmental Performance**

Corporations seeking to join the new industrial revolution must develop a proactive environmen-

tal management system that sets out goals and objectives and measures performance aimed at continuous environmental improvement.

***Performance Requirements***

Experience suggests that proactive environmental management requires companies to integrate several basic principles into their overall business strategy. Proactive firms:<sup>38</sup>

- adopt an environmental policy that seeks to eliminate pollution based on life-cycle assessment of the firm's operations, and communicate the policy throughout the company and to corporate stakeholders;
- objectively assess the effectiveness of environmental programs;
- compare the company's environmental performance with that of the leading firms in the industry through benchmarking and best-practices assessments;
- Promulgate a company view that environmental performance is the responsibility of all employees;
- analyze the impact of environmental issues on the future demand for products and the competitive economics of the industry;
- encourage frequent discussion of environmental issues and activities at board meetings;
- develop and apply a formal system for monitoring proposed regulatory changes and for complying with changing regulations;
- routinely conduct environmental due diligence on potential acquisitions;
- develop budgets for environmental expenditures so that the firm does not incur surprise expenses that materially affect profitability; and
- identify and quantify environmental liabilities from past operations and develop plans for minimizing those liabilities.

***Elements of Successful Performance***

As Figure 3 illustrates, these characteristics are combined in six critical elements to create an effective proactive environmental management system.

***Top Management Leadership***

Because proactive environmental management requires a champion, success depends on securing the backing of top management. In 52 percent of the responses to the McKinsey survey, executives reported that a board member had specific respon-



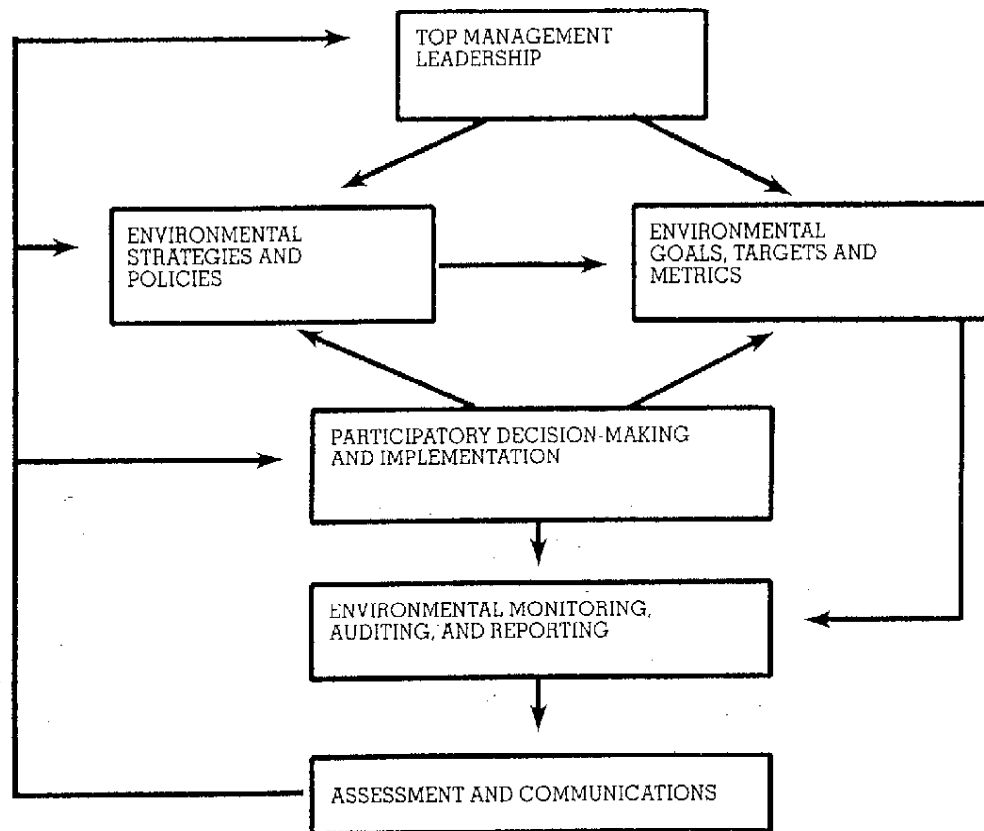


FIGURE 3

## Elements of Proactive Environmental Performance

sibility for environmental issues. In many companies the champion is the chairman or CEO. At DuPont, for example, former chairman Edgar Woolard led the company's drive toward proactive environmental management. Under Woolard's leadership, DuPont adopted a strategy in the early 1990s that concentrated the company's efforts on environmental opportunities rather than liabilities and set off a corporate-wide search for environmentally beneficial products and processes.<sup>39</sup> At SC Johnson, chairman Sam Johnson was the driving force in moving the corporation toward a sustainable environmental strategy. Other corporations assign a senior executive—a vice president for environment, health and safety or a senior manager of public affairs—to champion the program on a day-to-day basis. The champion must be a person with superior managerial skills and influence within the organization and with the authority to allocate adequate resources to environmental management.

*Environmental Strategies and Policies*

Proactive companies begin with a policy and a plan that reflect sound environment goals and se-

cure top management commitment and long-term funding. More than 79 percent of the executives responding to the McKinsey survey reported that their firms had written company environmental policy statements. Good policies identify environmental protection as a priority and are reinforced with specific goals, target dates, and issue-specific policies and procedures. The policies are backed up by a long-term strategy. The policy and strategy mandate a strong program to monitor performance and take corrective action when necessary.

*Goals, Targets, and Metrics*

Because environmental issues, unlike many other business issues, is about special values, symbols are important. Because proactive environmental programs must generate a high level of passion within the organization, environmental goals should be specific and memorable. Thus, many firms adopt an environmental motto or symbol to focus employee and public attention on their objectives—"Pollution Prevention Pays" at 3M, "Waste Reduction Always Pays" at Dow, "Priority One" at Monsanto, and "Save Money and Reduce Toxics" (SMART) at Chevron. But beyond slogans

and symbols, successful companies declare clear goals and measurable targets. NORTEL, the Canadian-based telecommunications MNC, established clear and specific targets for the years 1993 to 2000: 50 percent reduction in pollutant releases, 50 percent reduction in solid wastes, 30 percent reduction in paper purchases, and 10 percent improvement in energy efficiency.<sup>40</sup> Kodak uses its customer satisfaction objective as its environmental goal: "to create customer confidence with on-time delivery of defect-free, reliable products and services exactly as ordered with no wasted material or labor."<sup>41</sup>

Corporations that excel at environmental performance live by the rule that what gets measured gets done. NORTEL's Environmental Performance Index (EPI), for example, uses the annual costs of sales to normalize performance relative to production. Using the EPI, NORTEL can provide a single overall rating of its performance against goals by measuring more than 20 parameters weighted according to such criteria as environmental impact and degree of risk. NORTEL also monitors performance through audits of manufacturing and research facilities conducted by internal and external auditors.<sup>42</sup>

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***Participatory Decision-making and Implementation***

For an environmental policy to be meaningful, there must be absolute commitment to service, quality, and employee involvement. Successful companies have found that environmental management works only if it is decentralized. In successful companies, policies are implemented in all departments to make the environmental perspective part of the organizational culture and of every business decision. Everyone associated with the business must be involved, including suppliers and customers. About 76 percent of the executives who responded to the McKinsey survey reported that production shutdown decisions related to environmental threats have been delegated to personnel at operating levels; that is, to second-tier managers at the plant or location, to managers of production units, or to production supervisors. Carrots, not sticks, are the best tools for motivating employees and stakeholders to practice continuous improvement. They require formal reporting

relationships within departments and across divisions, and streamlined yet comprehensive management information and record-keeping systems. Career tracks must be created for environmental professionals. Key individuals must be identified in divisions to serve as liaisons with the environmental department. Training and education programs are essential for environmental staff and key managers.

***Monitoring, Auditing, and Reporting***

Monitoring, auditing, and reporting are important parts of formal inspection programs. About 57 percent of the executives surveyed by McKinsey reported that their firms had compliance audit systems. These programs are based on accurate emission inventories that are useful in measuring compliance and improving operational efficiency. Georgia Power Company has developed an environmental performance measurement program with the participation of facility managers, employees, environmental-affairs department personnel, and upper management of the company to identify four environmental-management areas of concern to stakeholders—compliance, employee training, environmental enhancements, and pollution prevention.<sup>43</sup> Performance indicators were developed for each area to focus management and employees on ways of reducing adverse environmental impacts of energy generation and distribution. Georgia Power is also developing environmental-performance measurements systems for nuclear facilities and service organizations.

In progressive firms, environmental audit results are often used to set priorities and establish costs. Once a company knows about the back end of the business, for example, managers discover ways to save money on disposal costs. An increasing number of companies are using commercial waste audits to systematically account for materials input and product/waste output and to identify procedures with potential for waste reduction or recycling. Before applying the audits, many business executives were either unaware that they were throwing away valuable resources or did not know how to set up their own waste-reduction and recycling programs.

***Assessment and Communications***

Companies must make effective use of corporate intelligence and external information to continually reevaluate their proactive programs and balance environmental and business priorities. Those that do well in environmental management recog-

nize the needs of various constituencies, including employees, customers, shareholders, environmental groups, and the public. They know that communicating environmental performance is important to corporate image and stakeholder support. Part of an effective environmental-management program involves communicating changes in environmental posture to management, employees, and the public. Monitoring the environmental consequences of business operations, goods, and services, and the evolution of the green agenda helps build bridges to stakeholders, and lets the public know what the company is doing.

### Accelerating the New Industrial Revolution

The new industrial revolution that Schmidheiny and other corporate leaders have predicted will spread because the world's resources are finite and the demands on them are growing rapidly. Corporations that do not adopt proactive approaches to environmental management will simply not be competitive in the global economy of the 21st century. As the need for proactive environmental management becomes clear, the search for innovative approaches to pollution prevention is moving beyond individual firms to intercorporate networks and strategic alliances. The concepts of zero pollution and industrial ecology are providing

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firms with new frameworks for working together to solve environmental problems. Industrial ecology views industries as living organisms; the byproduct of every metabolic process is food for another organism. One company's waste is another company's raw material.<sup>44</sup> Industrial ecology and zero pollution concepts are making it easier for corporations located close to design facilities that exchange energy and materials to develop eco-industrial parks, in which plants from different industries can exchange inputs and outputs with each other to their mutual benefit and to the benefit of the environment.

Proactive environmental performance requires a systematic management framework for information collection, analysis, evaluation, and continuous improvement. Successful proactive firms start with assuring compliance. They monitor existing

and emerging control strategies and adopt the latest control techniques. This allows them operating freedom to move beyond compliance. They then progress to building environmental considerations into product and service design. In some cases, this means revising the organizational structure to maximize the environmental program's visibility, accessibility, and effectiveness, and investing in environmental science and technology. Firms must then move steadily toward life cycle analysis of all of their products and operations to eliminate waste and prevent pollution.

The pace at which the new industrial revolution spreads will depend on the adoption of proactive environmental management by small-end medium-sized companies, as well as by large corporations. Although proactive environmental management was pioneered in large firms and has filtered down slower to smaller firms, small- and medium-sized companies will adopt pollution-prevention practices when they can easily obtain information about them, learn to apply life cycle analysis, and get access to technical assistance.<sup>45</sup> Technical assistance provided by the Division of Pollution Prevention and Environmental Assistance in North Carolina's Department of Environment and Natural Resources, for example, has accelerated the adoption of pollution-prevention practices among the state's smaller firms.<sup>46</sup> The spread of proactive environmental management will ultimately come through wider recognition among businesses of all sizes that there are savings inherent in waste reduction and elimination, that product stewardship and design for environmental satisfy customer needs, and that pollution prevention saves money and provides profitable business opportunities.<sup>47</sup>

Universities and industry associations have an important role to play in research and development on pollution prevention in benchmarking, assessing, and disseminating best practices, and in working with companies to develop proactive environmental management programs. Governments can accelerate the adoption of pollution prevention by recognizing and rewarding corporations that move beyond compliance in their enforcement of regulations, in tax policies, and in permitting requirements. Governments must explore market-based mechanisms that reward proactive companies and impose direct costs on polluting firms. The use of more flexible compliance options, emission or effluent charges, product changes, enforcement incentives, emissions trading, environmental performance bonds, and deposit-refund system, for example, can help assure that the costs of pollution prevention are assigned to polluters and that

proactive companies are rewarded.<sup>48</sup> Governments need to provide stronger financial and legal incentives for companies to seek out and use pollution-prevention solutions to environmental problems.

Accelerating the new industrial revolution will require changing the perceptions of legislators, government regulatory officials, business leaders, and environmental interest groups of their own and of each others' roles in environmental protection. Those perceptions have evolved from a base of mistrust, misunderstanding, hostility, and adversarial interaction. The spread of proactive environmental management requires that governments, businesses, universities, environmental groups, and industry associations work together in partnerships that seek new solutions to environmental problems and that develop the processes, services, and technologies that prevent pollution at the source.

## Endnotes

<sup>1</sup> Schmidheiny, S. 1992. *Changing Course: A Global Business Perspective on Development and the Environment*. (Cambridge, MA: MIT Press), quote at page 82. The Business Council for Sustainable Development, consisting of 50 of the world's leading corporation executives, was formed at the suggestion of the secretary general of the 1992 United Nations Conference on Environment and Development to take a long-term global view of the role of business in environmental management and development.

<sup>2</sup> S. Hart. 1997. Beyond Greening: Strategies for a Sustainable World. *Harvard Business Review*, (January-February): 66-77.

<sup>3</sup> McKinsey & Company. 1991. *The Corporate Response to the Environmental Challenge*. Summary Report, Amsterdam, the Netherlands: McKinsey & Company.

<sup>4</sup> D. A. Rondinelli and M. A. Berry. 1997. Industry's Role in Air Quality Improvement: Environmental Management Opportunities for the 21st Century. *Environmental Quality Management*, 7: 31-44.

<sup>5</sup> J. Makower. 1993. *The E-Factor: The Bottom Line Approach to Environmentally Responsible Business*, New York: Tilden Press.

<sup>6</sup> T. F. P. Sullivan, (ed). 1992. *The Greening of American Business—Making Bottom Line Sense of Environmental Responsibility*, Rockville, MD: Government Institutes, Inc.

<sup>7</sup> J. Schot and K. Fischer. 1993. Introduction: The Greening of the Industrial Firm. In K. Fischer and J. Schot (Eds.), *Environmental Strategies for Industry: International Perspectives on Research Needs and Policy Implications*, Washington, DC: Island Press: 1-33.

<sup>8</sup> R. K. Jain, W. Weiner, R. V. Kolluru, and A. C. Pizzorusso. 1994. Regulatory Framework: United States, Canada and Mexico. In Rao V. Kolluru (Ed.), *Environmental Strategies Handbook*, New York: McGraw Hill: 67-118.

<sup>9</sup> D. A. Rondinelli, and G. Vastag. 1996. International Environmental Management Standards and Corporate Policies: An Integrative Framework. *California Management Review*, 39: 106-122.

<sup>10</sup> J. Symonds. 1996. The Mobil Survey: More than 127,000 ISO Certificates. *ISO 9000 News*, (November/December): 1-5.

<sup>11</sup> J. A. Cichowicz. 1996. Should ISO 14000 be Linked with ISO 9000? *Environmental Quality Management*, 6: 77-80.

<sup>12</sup> T. Tibor with I. Feldman. 1996. *ISO 14000: A Guide to the New Environmental Management Standards*, Chicago: Irwin.

<sup>13</sup> G. H. Weaver. 1996. *Strategic Environmental Management: Using TQEM and ISO 14000 for Competitive Advantage*. New York: John Wiley and Sons.

<sup>14</sup> 3M Corporation, 1996. *3M Environmental Progress Report*. Minneapolis, MN: 3M Corporation.

<sup>15</sup> R. P. Bringer, and D. M. Benforado. 1994. Pollution Prevention and Total Quality Environmental Management: Impact on the Bottom Line and Competitive Position. In R. V. Kolluru (Ed.), *Environmental Strategies Handbook*. New York: McGraw Hill: 165-197.

<sup>16</sup> T. W. Zosel. 1994. Pollution Prevention in the Chemical Industry. In D. S. Edgerly (Ed.) *Opportunities for Innovation: Pollution Prevention*, Washington, DC: U.S. Department of Commerce, National Institute of Standards and Technology: 13-25.

<sup>17</sup> K. Futornick. 1995. Government and Industry Programs for Reducing Pollution. In T. E. Higgins (Ed.), *Pollution Prevention Handbook*, Boca Raton, FL: Lewis Publishers: 15-42.

<sup>18</sup> *Business and the Environment*. 1996. Earthshell Designs Packaging Using Lifecycle Inventory. December: 11-12.

<sup>19</sup> *Business and the Environment*. 1996. Canadian Pulp and Paper Industry to Develop Closed-Loop Technologies. November: 8-9.

<sup>20</sup> R. Topping. 1996. The Energy Industry: Dateline 2010, *Prism*, First Quarter: 75.

<sup>21</sup> Procter & Gamble. 1997. *P&G Environmental Progress Report 1996*. Cincinnati, Ohio: Procter & Gamble.

<sup>22</sup> J. Magretta. 1997. Growth Through Global Sustainability: An Interview with Monsanto's CEO Robert B. Shapiro. *Harvard Business Review*, January-February: 79-88.

<sup>23</sup> Procter & Gamble. *Environmental Progress Report 1995*. Cincinnati, OH: Procter & Gamble.

<sup>24</sup> *Business and the Environment*. 1996. Dell Converts Computer Line to Recyclable Chassis December: 10-11.

<sup>25</sup> *Business and the Environment*. 1996. Reuse Conference Examines Options and Challenges. September: 5-7.

<sup>26</sup> D. Varacchi. 1996. Saturn Corporation: Setting Environmental Standards for the Automotive Industry. *Corporate Environmental Management*, 4: 31-39.

<sup>27</sup> *Business and the Environment*. 1996. GE Plastics Funds DFE Study of Automotive Instrument Panels. 7: 9.

<sup>28</sup> P. S. Dillon, and M. S. Baram. 1993. Forces Shaping the Development and Use of Product Stewardship in the Private Sector. In K. Fischer and J. Schot (Eds.), *Environmental Strategies for Industry: International Perspectives on Research Needs and Policy Implications*, Washington, DC: Island Press: 329-341.

<sup>29</sup> C. C. Henn, and J. A. Fava. 1994. Life Cycle Analysis and Resource Management. In R. V. Kolluru (Ed.), *Environmental Strategies Handbook*, New York: McGraw Hill: 541-641.

<sup>30</sup> D. J. Hunkeler, and E. A. Huang. 1996. LCA in Japan: A Survey of Current Practices and Legislative Trends and Comparison to the United States. *Environmental Quality Management*, 6: 81-91.

<sup>31</sup> Eastman Kodak Corporation. 1996. *Health, Safety and Environment 1995 Report*, Rochester, NY: Kodak.

<sup>32</sup> SC Johnson & Son, Inc. 1996. 1990-1995 Sustainable Progress Report, Racine, Wisconsin: SC Johnson and Son.

<sup>33</sup> D. A. Rondinelli, M. A. Berry, and G. Vastag. 1997. Strategic Programming for Environmental Management: Sonoco's Take-back Policy. *Business Horizons*, 40: 23-32.

<sup>34</sup> E. Kirschner. 1994. Full Cost Accounting for the Environment. *Chemical Week*, 154:25-26.

<sup>35</sup> W. G. Russell, S. L. Skalak, and G. Miller. 1995. Environmental Cost Accounting: The Bottom Line for Environmental Quality Management. In J. T. Willig (Ed), *Auditing for Environ-*

mental Quality Leadership, New York: John Wiley and Sons: 107-120.

<sup>36</sup> M. J. Epstein. 1996. Improving Environmental Management with Full Environmental Cost Accounting. *Environmental Quality Management*, 6: 11-22.

<sup>37</sup> D. Ditz, and others. 1995. *Green Ledgers: Case Studies in Corporate Environmental Accounting*, Washington, DC: World Resources Institute.

<sup>38</sup> J. M. Petulla. 1987. *Environmental Protection in the United States*, San Francisco, CA: San Francisco Study Center; G. H. Weaver. 1996. *Strategic Environmental Management*, New York: John Wiley and Sons.

<sup>39</sup> *Business and the Environment*. 1996. DuPont's Integration Efforts Include Seeking Business Opportunities, 7: 6-7.

<sup>40</sup> M. G. Kerr. 1995. Looking at Environmental Management through the Lens of Quality. Mississauga, Ontario, Canada: NORTEL.

<sup>41</sup> Eastman Kodak Corporation. 1996. *Health, Safety and Environment 1995 Report*, Rochester, NY: Kodak.

<sup>42</sup> Northern Telecom. 1995. *Environmental Progress Report*. Mississauga, Ontario, Canada: NORTEL.

<sup>43</sup> R. M. Metcalf, and W. R. Woodall, Jr., C. M. Hobson, and P. L. Williams. 1996. Environmental Performance Measurement: A Case Study. *Environmental Quality Management*, 6: 27-37.

<sup>44</sup> B. R. Allenby, and D. J. Richards, (Eds.), 1994. *The Greening of Industrial Ecosystems*, Washington, DC: National Academy of Engineering.

<sup>45</sup> D. H. Kiel. 1996. Comparing EQM Practices of Small and large Companies. *Environmental Quality Management*, 6: 31-42.

<sup>46</sup> North Carolina Department of Environment, Health and Natural Resources. 1994. *Pollution Prevention Case Studies*, Raleigh, NC: DEHNR.

<sup>47</sup> S. J. Bennet. 1994. *Ecopreneuring—The Complete Guide to Small Business Opportunities from the Environmental Revolution*, New York: John Wiley & Sons.

<sup>48</sup> J. B. Opschoor, A. F. deSavonin Lohman, and H. B. Vos. 1995. *Managing the Environment: The Role of Economic Instruments*, Paris: Organization for Economic Cooperation and Development.

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